DESCRIPTION OF THE TEST SPECIMEN OF THE ROSTRO-CARINATE INDUSTRY FOUND BENEATH THE NORWICH CRAG

E. R. Lankester.

ROYAL ANTHROPOLOGICAL INSTITUTE.

Description of the Test Specimen of the Rostro-Carinate Industry found beneath the Norwich Crag.

BY

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[*WITH PLATES I–III.*]

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By Sir Ray Lankester, K.C.B., F.R.S.

[With Plates I, II and III, and Text Figures 1 to 14.]

Introduction.

In the present communication I propose to describe and to give very careful photographic pictures of a "rostro-carinate" flint implement—which is the most skilfully worked and the best preserved specimen of this class of implements that is known to me.

I propose to refer to this specimen of a "rostro-carinate" or "eagle's-beak" flint implement now and hereafter as "the Norwich test specimen." It was found by Mr. W. G. Clarke, of Norwich, in a pit at Whitlingham near that city in April, 1911, where he had previously obtained many other flints which, though much rougher than that here figured, are regarded by him and others as showing evidence of human workmanship.

I have myself visited Whitlingham in company with Mr. Clarke, and have examined a large number of these flints. The specimen now in question was sent by Mr. Clarke directly to Dr. Allen Sturge, of Icklingham Hall, who has kindly lent it to me.

In regard to Mr. Clarke's discovery of rostro-carinate implements near Norwich, I made the following statement in my memoir on this subject published in the *Phil. Trans. of the Royal Society*, Vol. 202 (1912).

> "The Norwich area of the land surface was even better furnished with the big flint nodules of the chalk than was the Ipswich area, and it is therefore not surprising that eagle's-beak worked flints, similar to those found by Mr. Moir in Suffolk, have been found in the basal bed of the Norwich Crag. They were discovered by Mr. W. G. Clarke as long ago as 1905. About two hundred 'implements' were found by Mr. Clarke and Mr. Rye at Eaton, near Norwich, in a thin bed resting directly on the chalk, and topped by about 30 feet of pebbly gravels and sands. These topping beds were considered to be 'early glacial,' and the flints were classed under the vague term 'eoliths.' Later, in 1908 and 1909, implements[1] of the same type were found by Mr. Clarke

[1] The term "humanly-worked flints" would be preferable to "implements," since only a small percentage of these specimens from Eaton and from Whitlingham have a characteristic shape suggesting a "tool" or "implement."—*E. R. L.*, October, 1913.

beneath sands and gravels which were regarded by Mr. H. B. Woodward, F.R.S., as 'Upper Crag.' But little importance had been attached to these flints 'until Mr. Moir's first notification of his discoveries, and then,' writes Mr. Clarke, 'I began to suspect that Mr. Woodward might possibly be right in his description of the beds as Upper Crag. In October, 1909, I found the same type of 'implements' in the same position at Alderford Common (Swannington), but the 'Geological Memoir'[1] (East Dereham, p. 15) showed the same divergence of opinion as to whether the overlying beds (Bure Valley gravels) were early Glacial or Upper Crag. Not until April, 1910, when I found the 'implements' at Whitlingham, beneath Crag beds (with shells), were my doubts removed. Mr. Moir had, however, previously authenticated his finds, and I have certainly no wish to reduce in any way the merits of his discoveries, which he prosecuted with far more zeal and perseverance than I did. It was not until his first notes on the subject appeared that the possibility of my specimens being Pre-Crag occurred to me with any force. Specimens of the Eaton 'implements' were placed in Norwich Castle Museum in April, 1909 (Mr. Walter Rye being the donor), and I have also given specimens to Leicester Museum, Yarmouth Tolhouse Museum, and to various private collectors."

I reproduce on the following page the figure (given in my memoir just cited) of one of Mr. Clarke's earlier-discovered rostro-carinate implements for the purpose of comparison with the comparatively "perfect" and skilfully worked "test" specimen figured in the present communication.

I do not propose on the present occasion to discuss the geological age of the "Norwich test specimen," to which I now direct attention. In fact I wish to leave that matter out of view and to ask those who have some knowledge of flint implements and of the natural fracture of flints to decide without prejudice or regard to its possible age, whether the flaking and shaping of this particular piece of flint is the work of man or whether there is—on the face of it—any remote degree of probability that it has assumed its present form through the operation of non-human fracturing agencies such as accidental exposure to frost or to great solar heat, the accidental impact of other stones propelled by waves or currents of water, or again through the accidental crushing of this stone by others during sliding movement of the strata in which it was embedded, or through the accumulation of a vast weight of ice or of sandy deposit above it, accompanied or not accompanied by lateral movement.

It seems to me that the only way in which we can hope to make any progress towards a common agreement in regard to the question of the human or non-human flaking of certain flints to which I have given the name "rostro-carinate" is by selecting the specimens which are most decisively in favour of the conclusion that their *form* is due to human workmanship. When once it is agreed that even

[1] Of H.M. Geological Survey of the United Kingdom.

one specimen is of human workmanship, we should proceed to the consideration of others of somewhat less convincing character and eventually deal with those which, though bearing indications of human fracturing sufficient in the opinion of certain

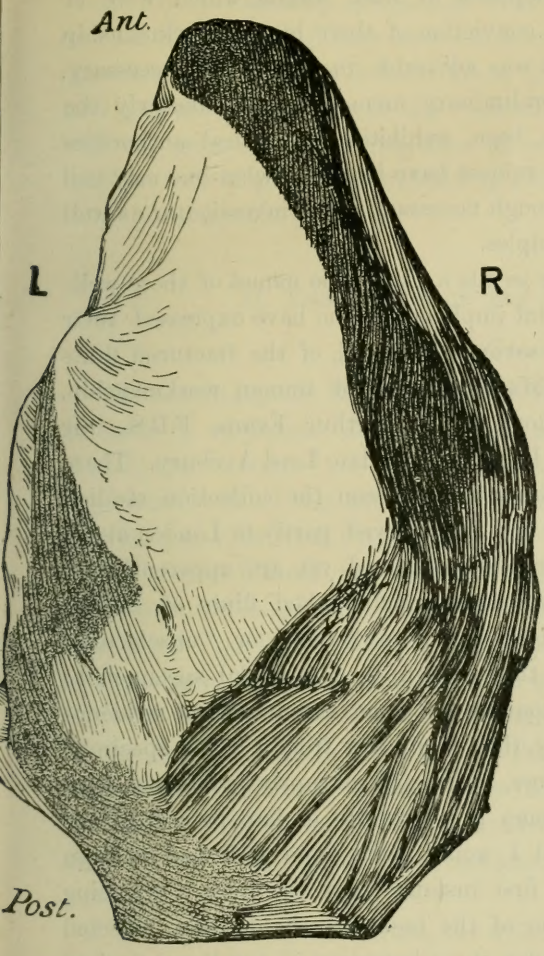


FIG. 1.

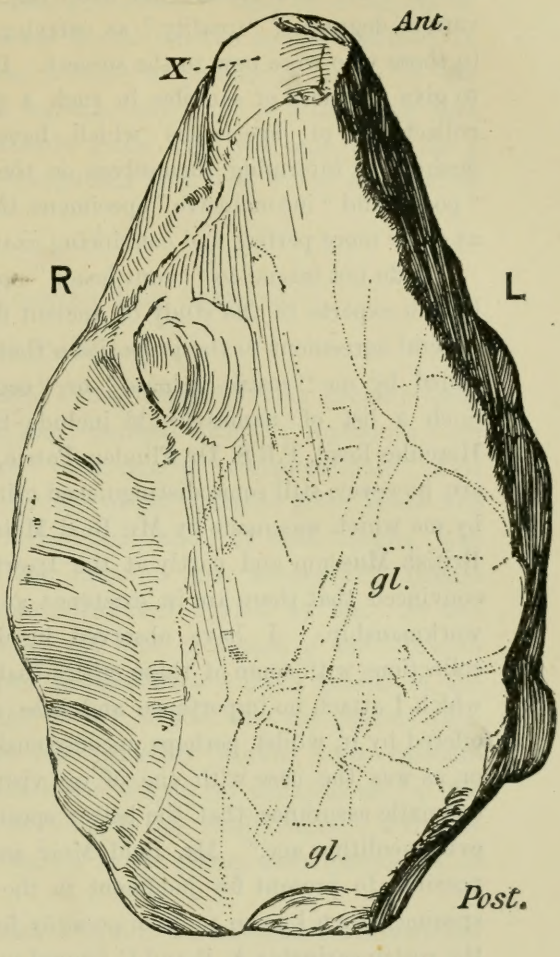


FIG. 2.

TEXT FIG. 1.—Dorsal view of a rostro-carinate flint implement from the "stone-bed" below the Norwich Crag; obtained with many others at Whitlingham, near Norwich, by Mr. W. G. Clarke. L, left; R, right side. The grain-tint indicates original unworked surface of the flint. Drawn of the actual size.

TEXT FIG. 2.—Ventral view of the specimen drawn in fig. 1. The special flat fractured surface behind the "beak" (which is very frequently seen in "rostro-carinates") is shown, and marked X. The rest of the ventral plane is remarkable as being formed in great part by one fracture. It is very flat and smooth, but is scored by numerous glacial scratches, which are marked *gl.*

observers to turn the balance in favour of that origin, are yet not inconceivably nor with very great improbability ascribed by other observers to "accidental" non-human agencies of fracture.

In my paper on these flints published in the *Philosophical Transactions of the Royal Society of London*, Vol. 202, read to the Society on November 16, 1911, I described and figured a dozen implements of the rostro-carinate shape and several others from both glacial and sub-Crag deposits in East Anglia, which were of various degrees of "quality" as carrying conviction of their human workmanship to those who were new to the subject. It was advisable, in fact almost necessary, to give a variety of samples in such a preliminary memoir. And similarly the collections of specimens which have been exhibited to critical authorities desirous of informing themselves on the subject have included what one may call "poor" and "inconclusive" specimens, though necessary to the investigator as well as other more perfect and convincing examples.

I do not intend to "count heads" nor to cite a list of the names of those well-known experts in the study of ancient flint implements who have expressed their general agreement to the proposition that several, if not all, of the fractured flints called by me "rostro-carinate" or "eagle's beak" are of human workmanship. Such a list of names would include those of Sir Arthur Evans, F.R.S., Sir Hercules Read, F.R.S., Dr. Flinders Petrie, F.R.S., and the late Lord Avebury. There are, however, still some distinguished critics who have seen the collection studied by me which was made by Mr. Reid Moir and is preserved, partly in London at the British Museum and partly at the Ipswich Museum, and yet are apparently not convinced that there are in existence any rostro-carinate flaked flints of human workmanship. I have observed in discussing "unweeded" or "unselected" collections with some of these critics that they seize upon a doubtful specimen to which I attach no importance and base conclusions upon the imperfect evidence offered by it, whilst, perhaps unconsciously, they turn away from a better specimen or, as was the case with one of my visitors, rashly and abruptly pronounce, with dogmatic assurance, that the better specimen is "certainly of late palæolithic or even neolithic age." Mr. Reid Moir and I would have done well, had it been possible, to present for judgment in the first instance only the most convincing specimen then known to us, or possibly four of the best. I should have selected the rostro-carinates A, B and C figured under those letterings in my Royal Society memoir and the large flint (not a rostro-carinate) of nearly 9 lbs. weight, the first sub-Crag implement recognized as such by Mr. Moir, with a flaking of both faces at one end resembling Chellean workmanship (drawn in figs. 38, 39, and 40 of my memoir in the *Phil. Trans.*). Taken alone and without reference to their geological horizon, these specimens would, I believe, have been accepted by all experts as indubitably of human workmanship.

When my memoir was read before the Royal Society in November, 1911, I was not aware of the existence of the rostro-carinate implement, now called by me "the Norwich test specimen," found some months earlier by Mr. Clarke, of Norwich, at Whitlingham. I may say, before going further into the matter, that in my judgment it is not possible for anyone acquainted with flint-workmanship and also with the non-human fracture of flint to maintain that it is even in a remote

degree probable that the sculpturing of this Norwich test flint was produced by other than human agency. I am of the opinion that the probability that it was produced by human agency is so overwhelming as to constitute what is called "certainty." I entirely sympathize with those who refuse to come to a conclusion on such a matter until they have examined for themselves the actual specimen in question. Nevertheless I have taken great trouble to produce a series of the best possible photographs of the "Norwich test specimen" and to print them here with the greatest fidelity in order to persuade those who will only come to a conclusion after personally examining the thing itself that it is worth their while to take the trouble to do so.[1]

II. Description of the Norwich Test Specimen.

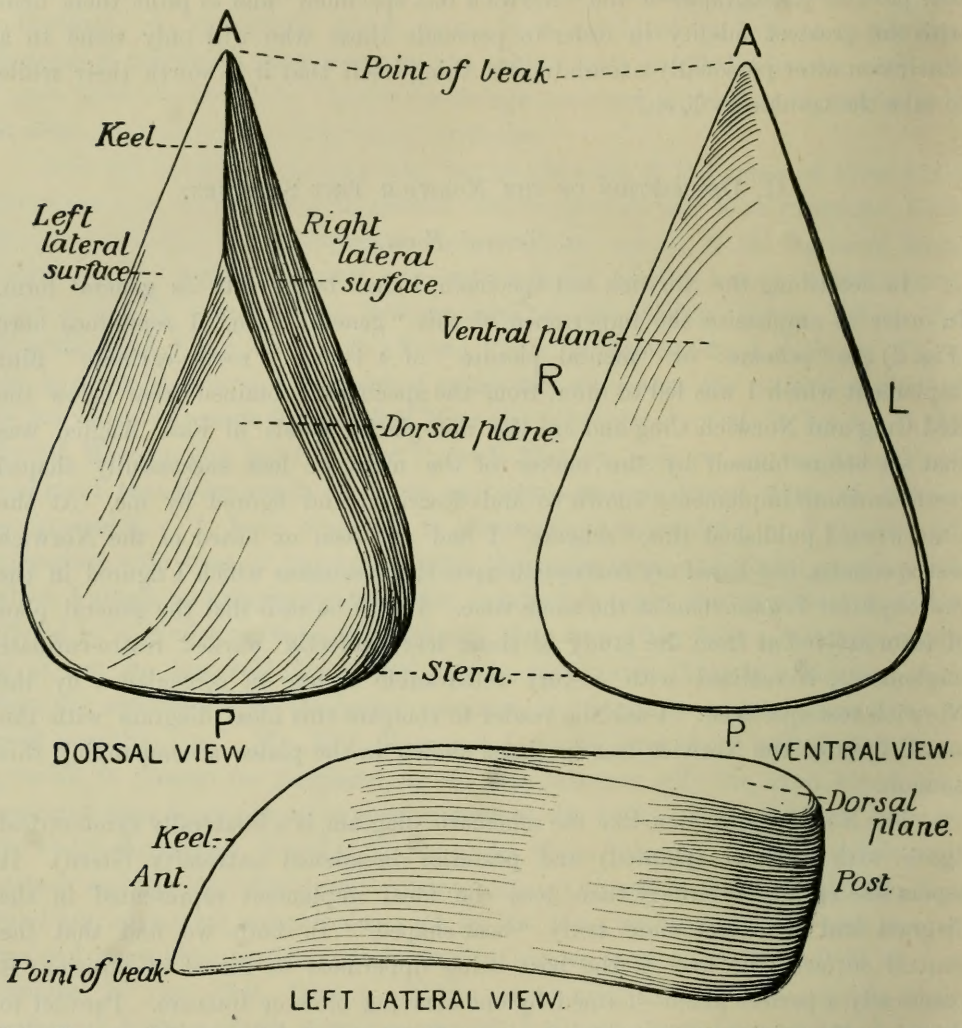
a. General Form.

In describing the Norwich test specimen, I shall begin with its general form. In order to emphasize the importance of this "general form," I reproduce here (Fig. 2) the "scheme" or "mental picture" of a typical "rostro-carinate" flint implement which I was led to infer, from the specimens obtained from below the Red Crag and Norwich Crag and in the mid-glacial sands of East Anglia, was that set before himself by the maker of the more or less successfully shaped rostro-carinate implements known to and described and figured by me. At the time when I published this "scheme," I had not seen or heard of the Norwich test specimen, but based my conception upon the specimens which I figured in the *Philosophical Transactions* at the same time. It will be seen that the general plan of form arrived at from the study of those less perfectly worked rostro-carinate implements, is realized with a very remarkable degree of coincidence by the Norwich test specimen. I ask the reader to compare this ideal diagram with the actual form of the Norwich test specimen shown in the plates accompanying this memoir.

The Norwich specimen, like the schematic diagram, is a bilaterally symmetrical figure with anterior (pointed) and posterior broadened extremity (stern). It tapers less rapidly anteriorly than does the ideal implement represented in the diagram and is in fact more truly "boat-shaped." In both we find that the ventral surface (the keel of the boat being uppermost or dorsal in position) is practically a perfect plane—formed by one cleaving blow or fracture. Parallel to this plane there is on the dorsal surface a small flat area in both the diagram and the Norwich specimen: I call it the dorsal plane or platform. Reaching forward from this, in both, is the "keel," or "carina," which separates the right and left slopes or sculptured sides (right and left lateral surfaces) of the implement. In the schematic drawing the keel is continued as a sharp edge to the extreme anterior

[1] The specimen (the Norwich test specimen of a rostro-carinate implement) has been temporarily placed by Dr. Allen Sturge in the Ethnological Department of the British Museum, Bloomsbury, where it can be examined by visitors.

termination of the implement, the converging lateral surfaces separated by the keel or ridge giving the anterior portion of the implement the form of a bird's beak. In the Norwich specimen the anterior third of the keel does not (as it does in many of these rostro-carinate implements) maintain the form of a narrow edge, or *arête*, but is somewhat widened by small chippings which have apparently been applied for the purpose of giving the anterior region a downward curvature and



TEXT FIG. 3.—Diagrams showing the ideal form aimed at by the makers of the rostro-carinate flint implements or "Eagles' Beaks" (Becs d'aigle). A, anterior; P, posterior; R, right; L, left.

(From the *Phil. Trans.*, *Roy. Soc.*, May, 1912.)

symmetry somewhat resembling that of the corresponding part in the beak of an accipitrine bird or that of the "bow" of a rowing-boat. The keel (carina or *arête* separating the anterior areas of the right and left sides of the implement) is not exactly true to the middle line in the Norwich specimen. The workman's

blows, in removing large flakes from the right and left sides, have resulted in giving the main *arête* or keel a divergence to the left from the mid-line. It is not surprising that in such work the artist should fail to obtain the perfect symmetry which he desired, although he succeeded to an astonishing degree in approaching that ideal symmetry. The originally narrow and sharp portion of the keel reaching from the dorsal plane to the slightly broadened mid-region of the beak, is broken by numerous very small fractures (see Fig. 1, Plate I, and Text Fig. 4, Car.). These were probably represented by "trimming" fractures larger and more regular when first made, which have broken up into their present condition as the result of "weathering." Such attrition of an elevated *arête* is frequently to be seen in ordinary palæolithic flint implements from river-bed terraces and is probably due to the "development" (by thermal and chemical vicissitudes) of small flaws set up in the delicate projecting "*arête*" by the repeated impact of other solid objects.

The preceding survey of the general form establishes the interesting fact that the form and plan of the Norwich test specimen is a close realization of that of the scheme or diagram at which I had arrived by the examination of a series of comparatively rough and ill-made specimens of the rostro-carinate type *before the Norwich test specimen* was known. The confirmation of my theoretical ideal of the rostro-carinate implement by the actual Norwich test specimen subsequently brought to my notice, is to some extent an indication that the hypothesis of human workmanship which guided me in the interpretation of the rougher specimens was correct.

b. The Separate Flakings.

The sculpturing of the Norwich test specimen by a series of about forty separate blows, producing fractures and detaching flakes of several different sizes, but all designed and directed so as to give the final shape desired, can be followed by a careful study of the specimen. The outline figures reproduced in the Text Figs. 4, 5, and 6 will serve best for a brief enumeration of these several shape-giving "flakings." The same and other similar outline drawings are printed on transparent paper and attached to the photographic plates so as to overlie the several views of the Norwich test implement to which they serve as an index. We can distinguish three groups of flakings on this flint of different size and importance. The first group comprises only two flakings, that of the dorsal plane (D.P. in the outline figures) and that which forms the large ventral plane, occupying the whole ventral surface and shown in Plate I, Fig. 3. These two fracture-surfaces differ from the others in their nature and the character of the blow required to produce them. The gun-flint makers of Brandon, in Suffolk, and those who trim flints to form a flat surface when used for building a church-wall, have the art of cleaving large blocks of flint so as to give a nearly flat horizontal surface, with little or no trace of a bulb of percussion or conchoidal fracture. The makers of rostro-carinate flint implements often produced the ventral surface of the implement by such a blow. Sometimes, as in the Norwich test specimen, two such plane surfaces were

produced. I think it probable that in this case (and in others which have come to my notice) the flint-worker, having selected a good sound flint-nodule of first rate quality, freshly removed from the chalk, proceeded to break it by two great cleaving blows into a *tabular* form—giving him a sound piece some five inches long by three broad and of an inch and a half to two inches in thickness to work on. The upper and the lower surfaces of the "table" produced by cleaving fracture were approximately parallel and smooth. It is not improbable that he proceeded in this way with the large flint-nodules of the East Anglian chalk, because he or his tribe had in some earlier times started their art of flint-sculpture in a district where tabular flint or tabular chert was ready to hand, formed by Nature. Be that as it may, he prepared his "chunk" in a tabular form and thus produced the dorsal and the ventral planes, which we see in the Norwich test specimen.

The second group of flakings on the Norwich specimen are of large size, but differ essentially from the tabular planes in being slightly concave and showing conchoidal concentric ridges and valleys. The curvature of these conchoidal markings is easily determined, and shows that the centre of percussion was, in the case of these larger flakings, outside the area of the present mass of flint, that is to say the flakes must have been struck off when the piece of flint was larger and by blows which impinged on large outstanding portions of the block which have since been cleared away by other blows. In the outline Figure 4, the surfaces left by these large shaping fractures are marked A B C D H K (of which the surface L is probably a part) M (of which the deep concavity Co is probably the centre of percussion). In each case (excepting D, where it is doubtful) the *direction* of the propagation of the fracture from the centre of percussion is shown on one or other of the figures, by an arrow. The two great fracture-surfaces A and B were, when freshly made, only separated by a sharp *arête*, the "carina," which is now broken down by smaller fractures and by "weathering" into a relatively wide path. The area marked I on the right side of the implement (shown in Text Figs. 4 and 5) seems to be part of an older surface which is much pitted and weathered.

Explanation of the Text Figures 4, 5, 6.

Fig. 4.—Outline sketch of the dorsal surface of the Norwich test specimen.
Fig. 5.—Similar sketch of the right side of the same specimen.
Fig. 6.—Similar sketch of the left side of the same specimen.

D.P.—Dorsal plane: a fracture of the first order, which includes only one other, viz., that of the ventral plane.
A.—Left anterior lateral major fracture.
B.—Right anterior major fracture.
C.—Left posterior major fracture.
D.—Right mid-lateral fracture.
M.—Right posterior major fracture.
Co.—Conchoidal concavity in the fracture M.
N.—Irregular angular fracture.
O.—Area of irregularly pitted surface.
P.—Postero-lateral fracture.

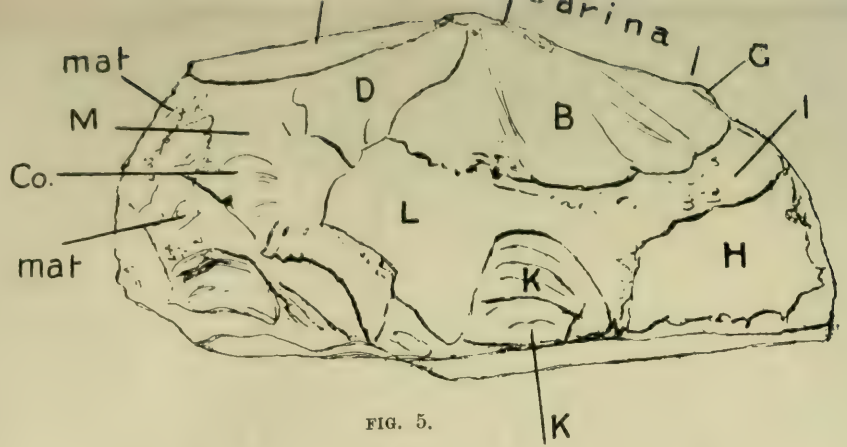


FIG. 5.

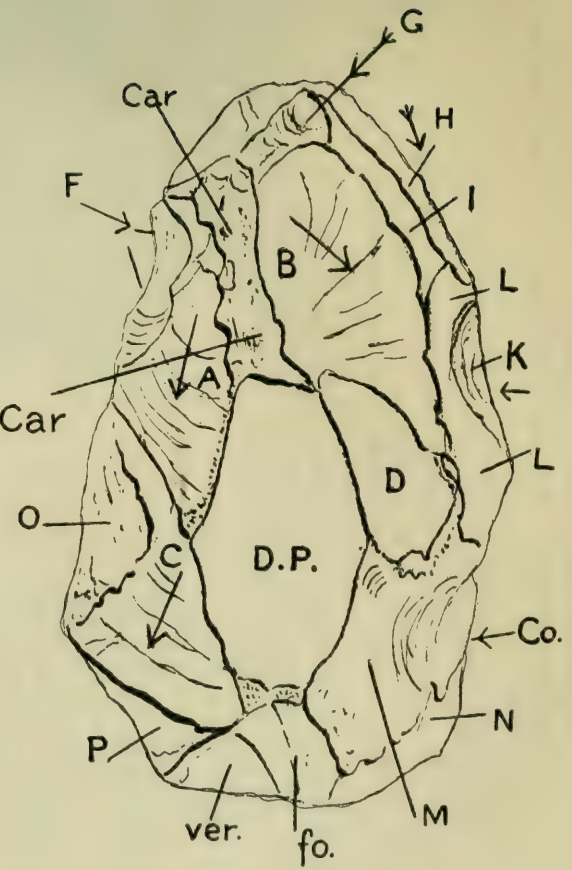


FIG. 4.

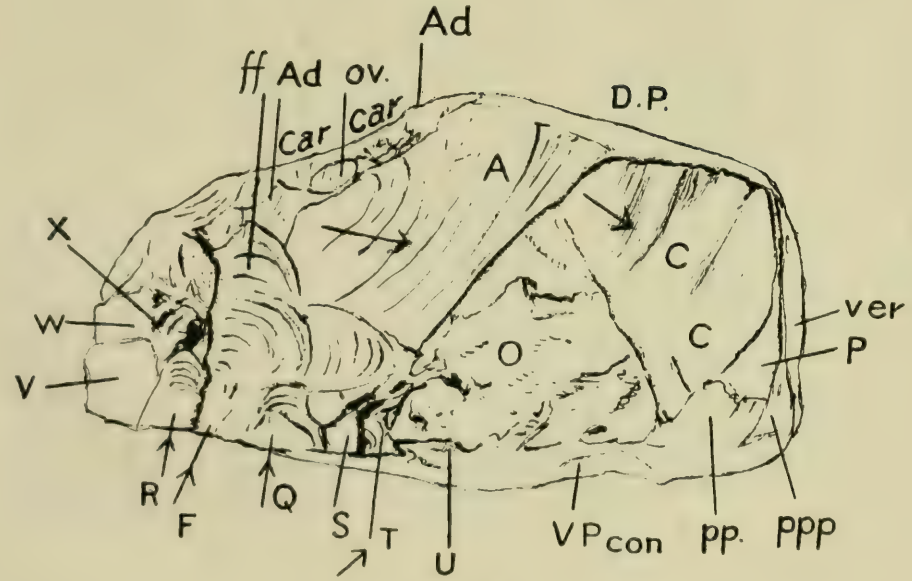


FIG. 6.

pp. and ppp.—Smaller "trimming" fractures adjacent to P.

VP con.—A small conchoidal fracture extending from the ventral plane. (See the same in Fig. 3, Plate I.)

F, f f.—A series of well-marked conchoidal fractures extending into the original area of the great conchoidal fracture A.

Q, R, S, T, U.– Small conchoidal fractures along the left inferior margin—produced in order to "trim" this region into final shape.

V, W, X.—Similar small trimming fractures on the left anterior surface of the beak.

car.—The broadened or trimmed and weathered carina or keel.

ov.—Small pit-like fracture on the left side of the carina.

Ad.—Similar small superficial fractures on the left side of the carina.

G.—Small trimming flaked-surface showing conchoidal grooving, and shaping the beak or anterior part of the implement.

H.—Right antero-lateral major fracture.

I.—A curiously pitted (weathered ?) surface between fractures G and H, not separated by an "arête" from the major fracture L.

K.—A strongly-marked marginal fracture of the right lateral surface, cutting into the major fracture L.

L.—Right infero-lateral major fracture, probably including the surface I and cut into by the marginal fracture K.

mat.—Roughened irregularly fractured surface to which granules of matrix are adherent.

ver.—Left vertical fracture of the posterior face or surface.

fo.—Deep chine-like vertical fissure (*see* Text Figs. 7 and 8).

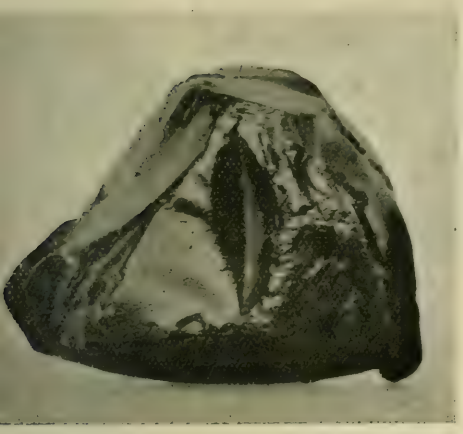
The extended area which it occupied previous to the shaping of the implement was carried away by the flakes detached from the positions marked B, H and K.

Inferior in size to these, yet often well marked in area and due to individual chipping blows of no great force which have formed concave conchoidally ribbed surfaces, are the third group of flaked-surfaces—those near the beak and along the latero-ventral margins, especially abundant on the left side of the implement. They are marked F, ff; P, pp, ppp; Q R, S, T, U, V, W, X. They have been chiefly used in getting the anterior part of the left lateral surface into shape. Very well marked, with conchoidal ribbings indicating their centres of origin, are the small chippings lettered G, on the top of the "beak" to its right side, where the narrow carina is flattened and widened out by several small flakings.

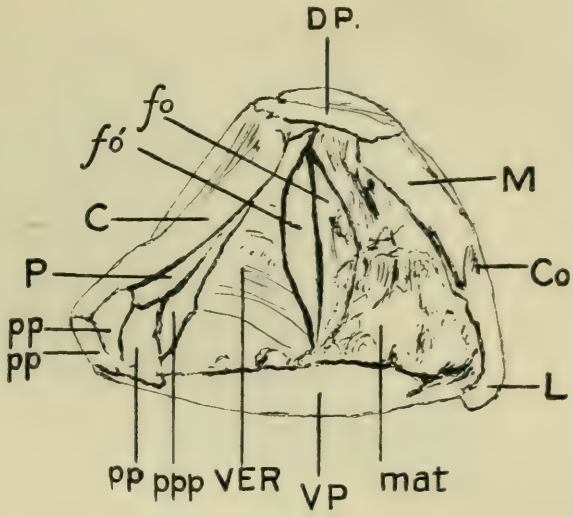
The region marked O on the left lateral surface of the implement is irregularly marked by small fractures and disintegrated. It owes its condition probably to the fact that the flint is at this part near the cortex of the original nodule. The region marked *mat* on the right lateral face has a thin layer of irregular sand-like granules adhering to it, such as is often seen in paleoliths from river gravels. The adhesion is probably due to a deposit of calcium carbonate, but I have not tested its chemical nature.

When we thus closely examine the fractures by which this piece of flint has been shaped, it becomes evident that they have been administered in definite order and that each and all have been directed so as to produce the symmetrical form and peculiar beak-like shape which it now presents. Not one of these fracture-surfaces can be regarded as "accidental" or as inappropriate to the realization of

the ideal rostro-carinate pattern. It is not possible (it seems to me) to entertain the supposition that these twenty-five distinct blows resulting in this special pattern or shape already recognized in other examples are due to "a fortuitous concourse" and reciprocal battering of flint-nodules. The posterior face of the



TEXT FIG. 7.



TEXT FIG. 8.

TEXT FIG. 7.—Posterior face of the Norwich specimen, showing the deep median chink.
TEXT FIG. 8.—Outline diagram of the same. The reference letters are as follows :—

REFERENCE LETTERS FOR TEXT FIG. 8.

D.P.—Dorsal plane.
V.P.—Ventral plane.
C, M, Co, mat and L as in Figs. 4, 5, 6.
P, pp, ppp.—Small shaping fractures of the left posterior angle of the implement.
VER.—Large vertical fracture of the posterior face (the same marked *ver.* in Figs. 4 and 6). This surface is the remnant of a very much larger flaked surface, the centre of percussion of which was an inch or more below the present ventral plane before the block of flint was reduced to its present size and before even the ventral plane had been "struck." This fact is indicated by the concentric waves of the surface being segments of a circle with a radius of at least two inches.
fo and fo'.—The two "banks" or converging faces of the deeply incised posterior vertical fissure or chine. This curious incision could not have been chipped out by small blows, but is the meeting line of two very large fractures caused by blows delivered on the flint when it was of much larger size and *before* the clearing away of the material which overlay the surface, VER.

Norwich test implement (Text Figs. 7 and 8) has a horizontal base-line which is at right angles to the long axis of the implement and is trimmed so as to be nearly upright by a large flake-surface on the left and smaller blows on the right. In the middle line is a deep upright cleft (*fo, fo'* in Fig. 8), which may very well have

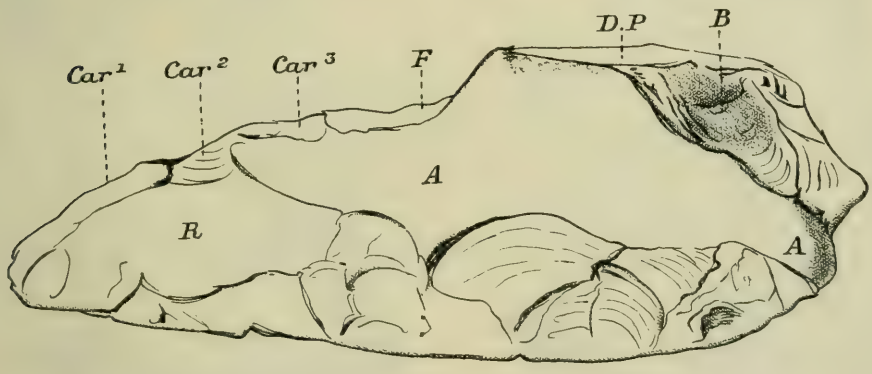
been useful in helping to fasten the implement to some kind of handle or support by "catching" a cord or thong, but could not have been made in its present form and size, after the trimming into shape of this posterior face. In fact, the cleft in question must have been formed by the meeting along its sunk middle line of two very large fractures taken off when the block of flint was of much greater size and extension posteriorly than it is now. It is, I think, questionable whether such a singular valley or depression as this could have been produced, in this position and relation, by purposeful blows on the part of the flint-worker, and I am inclined to think that this cleft had been undesignedly produced in the first stages of trimming the original block of flint and was then taken advantage of and "worked up to" by the artist as a median posterior "chink" or "chine." If this be so, the important fact presses itself on our attention that this is *the only fracture* on the whole surface of the implement which does not form part of a predetermined scheme of shaping to which every blow administered to its surface, and registered by the resulting flaked surfaces, was contributory. This strange cleft, though it may have been of use, could not have been produced deliberately by the flint-artist in its present relations after the "blocking out," or rough sculpturing of the implement, was complete.

III. Comparison of the Norwich Test Specimen with a Second Specimen of closely similar Design.

The human workmanship of the Norwich test specimen is (I think) undeniable when that specimen is taken by itself. But it becomes definitely assured when we find a second specimen of a flint implement worked on the same plan. I give here text figures, of the natural size, of such a second specimen. It is an Irish specimen which has been placed in my hands by Mr. W. G. Knowles, of Ballymena; I will refer below to its *provenance*. It is more elongate than the Norwich specimen, the beak being narrower and finer. The great point of resemblance to which I would direct attention is the existence of the dorsal plane, D.P., and the ventral plane, V.P., as in the Norwich specimen. The similarity of the ventral plane in the two, struck by a single blow, is demonstrated by a comparison of Text Fig. 14 and Plate I, Fig. 3. The dorsal plane, marked D.P. in Figs. 10 to 14, as in the figures of the Norwich specimen, is not made absolutely by one fracture as in the Norwich implement, but is the result of two large horizontal fractures and a little trimming. The "dorsal plane" has the same relation to the carina (Text Figs. 10 to 14, *Car.*) in both, but a somewhat deep fracture, F., has cleared away the carina immediately in front of the dorsal plane, D.P. In front of F, we find the "carina" as a narrow ridge worked into shape by several small longitudinal fractures along the mid-line, car^1, car^2, car^3 in the figures, recalling the fractured surface of the carina of the Norwich specimen. Some very bold flaking has shaped the left lateral surface. The large and long fracture marked A in Text Figs.

10, 11, 13, 14, takes the place of the two large fractures A and B of the Norwich specimen. Two large fractures, one on each side of the narrow tapering beak or rostrum (R on the left and Y on the right) are chiefly responsible for the form of that region, but numerous neatly made fractures have trimmed the lateral margins into shape where they meet the great ventral plane. These and the ventral plane,

TEXT FIG. 9.—Drawing of the rostro-carinate from Island Macgee, of the actual size, made by Sir Ray Lankester. The specimen is tilted so as to show the left side and the dorsal platform.



TEXT FIG. 10.—Diagram of the Macgee specimen in profile, left side. *D.P.*—Dorsal platform or plane. *F.*—Depression in front of it: *Car*¹, *Car*², *Car*³, small flaking of the carina. *A*, *R*, *B.*—Large flaking of left side. Other flakings not lettered.

clearly shown in Text Fig. 12, need no further description. The curious dip, F, in the median line or keel in front of the dorsal plane, D.P., is apparently not accidental (though perhaps the worker has accidentally made it larger in this implement than was intended), since we find also in the Norwich test specimen a slight concavity in the carinal line just in front of the dorsal plane (*see* the figures in Plates II and III, showing lateral view). This concavity would certainly have assisted the owner of the flint-implement in binding it by a thong to such a T-shaped handle as is used for mounting chipped stone weapons by some existing savages.

IV. MODE OF USE OF THESE IMPLEMENTS.

I am unwilling to complicate the discussion as to the human workmanship of these rostro-carinate flints by any digression as to the mode in which they may have been used. The very frequent (though not invariable) presence "in rostro-carinates" of a smooth, flat, ventral plane suggests that the implement may have been used as a "rubber" in dressing skins or bark or wood. At the same time the curved or

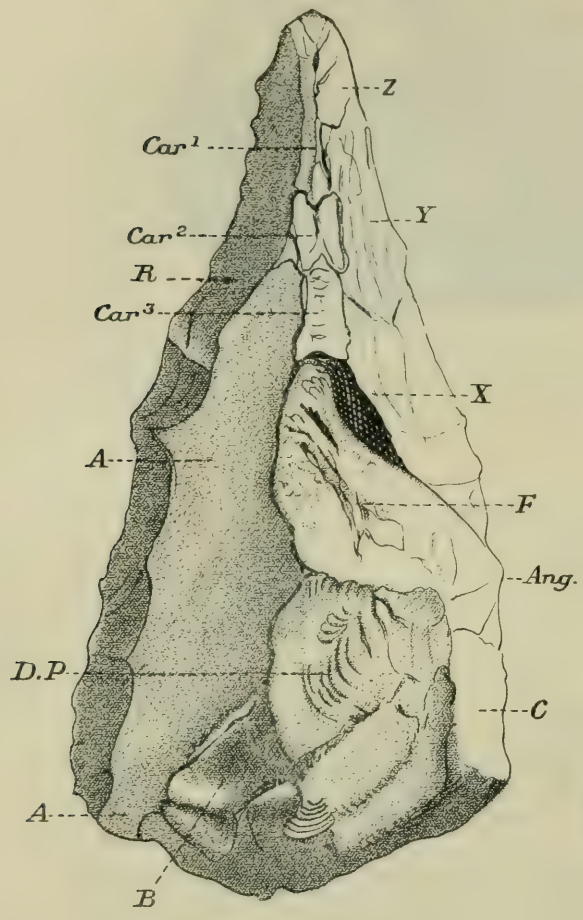


FIG. 11.

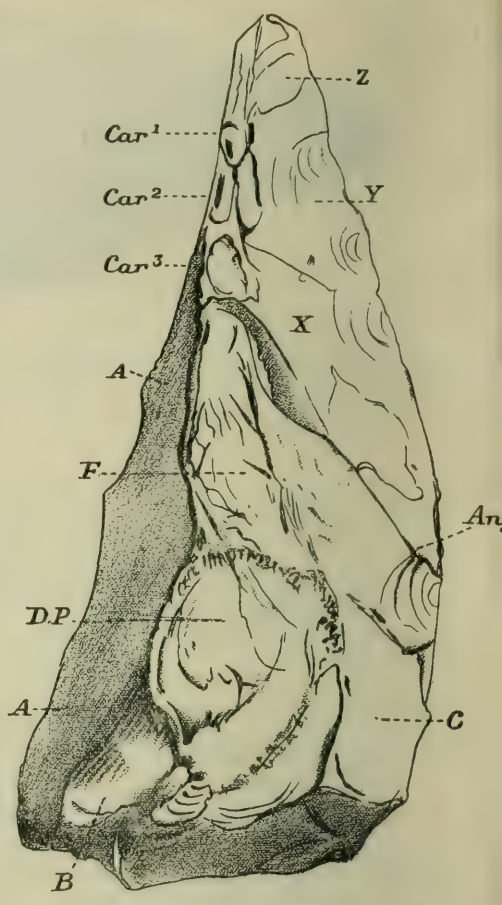


FIG. 12.

FIGS. 11 and 12.—Diagrams of the Macgee specimen seen from the dorsal surface. Fig. 12 rotated a little to the left. *Ang.* a prominent angle. The other letters are placed in order to facilitate the comparison of the diagrams, on the same flaking in each diagram.

nearly vertical anterior edge (carina) of the beak would make it useful, if mounted, as a hatchet or pick or hammer. Usually (though exceptions occur, for instance Sir John Evans' specimen from Lakenheath) the edge of the anterior part of the carina is not narrow enough to make it a cutting instrument, though the margins of the implement (where the lateral surfaces meet the ventral plane) are often sharp. It is obvious that when moved with the flat ventral plane downwards, with some

pressure along a piece of wood, some of these "rostro-carinates" would act very effectively as a carpenter's plane. They may have served all three purposes of rubber, plane and hatchet or pick in turn.

V. Rarity of well-shaped Rostro-Carinates.

It is a fact that both in the "bone-bed" beneath the Red Crag of Suffolk and in the "stone-bed" beneath the Norwich Crag, the number of well-shaped implements is extremely small. Whilst the number of oblong or block-like irregular pieces of flint, bearing fractures which are regarded by experts as due to blows struck by men, is very large (especially in the "stone-bed" of the pit at Whitlingham) we have only the one specimen, that here figured as the Norwich test specimen, from East Anglia which shows a high degree of skill in the shaping and symmetry given by the artist to his material. Two or three dozen specimens

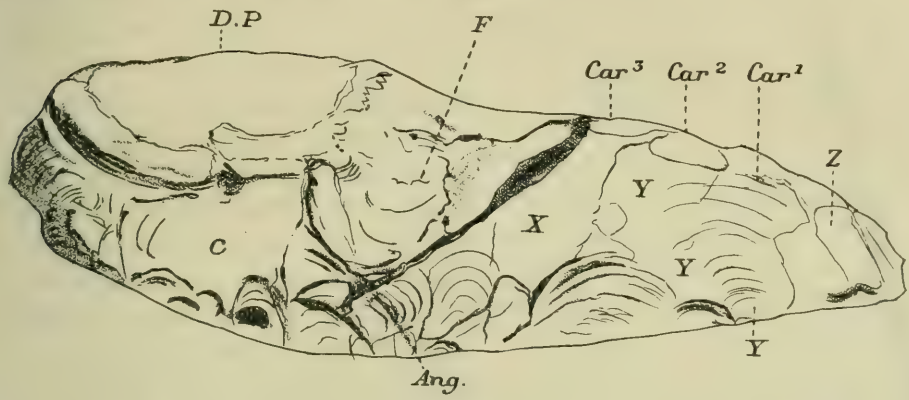


Fig. 13.—Profile view (diagram) of the Macgee specimen—seen from the right side. The letters are placed on the same flakings as in the other diagrams.

have been found and are preserved in museums (some figured by me (*loc. cit.*)), which show a definite beak-like shaping of one extremity produced by flaking and the similar production of a flat ventral surface. But though they are certainly definite implements of the rostro-carinate type they are not fine symmetrical things worked by a master's hand as is the Norwich test specimen. And with these are hundreds of roughly pyramidal and irregular "chunks" bearing the marks of fracture by heavy blows (especially abundant at Whitlingham). This combination of rare "good" and abundant "bad" implements can be explained if we suppose that in the localities where these have been found we have the remnants of ancient workshops in which the big chalk flints were continually being chipped into serviceable shape by the ancient workers, and that the fine, well-made, symmetrical implements were at once disposed of and carried off for use, whereas the third rate results and the irregular refuse, the work of "'prentice hands," were left in quantity on the spot where they were made, and were not moved far from it by the invasion of the

Crag Sea. The same association of abundant inferior specimens of human workmanship, with a very few specimens such as that figured in Text-Figs. 9 to 14, is noticed in the deposit in the north of Ireland in which it was found.

VI. Isolation of the "Rostro-Carinate" from other Types of Flint Implement.

The figures given in the present paper of the ideal and the two best-worked actual specimens of "rostro-carinate" flints are sufficient to show the complete distinctness of this type—with its high median ridge and high-pitched sides like a roof—from the flattened Chellian, Acheuillian and Moustierian types. There is no transition from the one to the other. They appear to have distinct origins and development. On the other hand, flint implements of definite rostro-carinate type, some of high finish, have been found by Mr. Reid Moir in the mid-glacial sands and again in the Chalky Boulder Clay of East Anglia. I have also received from Dr. Sturge specimens of flints of marked rostro-carinate design attributed by him, on account of blueish "patina" and other physical characteristics, to the neolithic age. They are identical in those features with neolithic flakes with which they were found at Icklingham, Suffolk. There is thus evidence of the occurrence of rostro-carinate flint implements in deposits of several successive ages, and it may be briefly stated here that the rostro-carinates have distinctive characters of form and workmanship in each horizon mentioned. They do not appear to be derivatives in the later from earlier deposits, as they are not water-worn and have in each case a distinctive "patina." On the other hand, I have seen three *water-worn* specimens of rostro-carinates which were found in river-terrace gravels, and have been at once recognized as derived from older deposits.

Fig. 14.—View of the ventral plane of the Macgee specimen. (Diagram.)

VII. The Geological Age of the Norwich Test Specimen and of the Irish Specimen of similar Design.

The human workmanship of the Norwich test rostro-carinate specimen will now be admitted by all "prehistorians," but some (I do not doubt) will be found to contend that it does not come from below the Norwich Crag. I have no doubt, from the comparison of its very peculiar dark colouring and characteristic "lustre" with that of the flints from the stone-bed at Whitlingham (nearly all of which are fractured and of large average size, not "pebbles"), where it was found, that it came out of that bed. The bed rests on the chalk. Above it there is light yellow-brown Norwich Crag with shells; above that we have paler coloured mid-glacial sands, thirty feet thick. The flints in the sands are totally unlike those of the stone-bed in colour, lustre and size. They are small, unbroken, water-worn pebbles. The stone-bed flints cannot be confused with the flints of any of the other horizons exposed in the Whitlingham pit. Geologists may have more to say hereafter as to the exact age of the Norwich Crag and of the Red Crag, but at present there is no reason to doubt that the stone-bed below the Norwich Crag resting on the chalk and containing teeth and bones of *Mastodon arvernensis* is of Pliocene age, and that the Norwich test specimen of the rostro-carinate type, having formed part of that bed, is not later in age than Pliocene, though it may be earlier.

The age of the remarkable Irish rostro-carinate flint implement which I received from Mr. W. G. Knowles, and have sketched in Text Figs. 9 to 14, is far from being well-ascertained. The implement is one of a very large number which have been found in a raised beach near Larne (Belfast). This one comes from the Island Macgee. The raised beach is from 20 to 25 feet above the present high-water mark and several implements were taken by Mr. W. G. Knowles himself from various depths in the undisturbed gravel. An account of this "raised beach", by Mr. Knowles is shortly to be published. I will only say here that there is plenty of chalk-containing flints in the neighbourhood of Larne, and that whatever may be the age of the deposition of the raised beach, some or all of the implements or other objects found in it may be of much greater antiquity than the date of deposition of the beach. It appears, then, that the determination of the probable age of the remarkable rostro-carinate from Island Macgee, figured in the Text Figs 9 to 14, is one requiring careful study by geologists. For my present purpose, namely that of establishing the existence of a definite type of rostro-carinate flint implement, of which the Norwich test specimen derived from the stone-bed below the Norwich Crag is an example, the precise age of the Macgee Island specimen is a matter of indifference.

EXPLANATION OF PLATES I, II AND III.

Illustrating Sir Ray Lankester's memoir entitled "Description of the Test Specimen of the Rostro-Carinate Industry found beneath the Norwich Crag."

All the figures are of the size of nature and are reproduced by process from photographs of the Norwich test specimen—excepting Figs. 2, 6 and 9, which are taken from a plaster cast of the specimen used in order to avoid the effect of colour and glaze in the attempt to portray form and sculpturing of the surface.

Fig. 1.—Dorsal view of the specimen—showing well the dorsal plane with its comminuted marginal arête, the much disintegrated keel or "carina" and the main "shaping flakings" of the right and left sides.

Fig. 2.—Similar view of a plaster cast of the specimen.

Fig. 3.—Ventral view of the specimen—showing the ventral plane formed by one flat fracture.

Figs. 4 and 5.—Two views of the left side of the specimen—both in absolute profile—but with different illumination.

Fig. 6.—A similar view of the plaster cast.

Figs. 7 and 8.—Two views of the right side of the specimen—both in absolute profile—but with different illumination.

Fig. 9.—A similar view of the plaster cast.

The lettering on the tracings printed on transparent paper is explained on pp. 8 and 10. The arrows indicate the direction of the blows which have produced the "flakings" in connection with them.

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FIG. 1.

FIG. 2.

FIG. 3.

E. Ray Lankester direxit.

A ROSTRO-CARINATE IMPLEMENT FROM BENEATH THE NORWICH CRAG.

on of the Test Specimen of the Rostro-Carinate Industry, found beneath the Norwich Crag.

FIG. 4.

FIG. 5.

FIG. 6.

E. Ray Lankester direxit.

A ROSTRO-CARINATE IMPLEMENT FROM BENEATH THE NORWICH CRAG.

Fig. 7

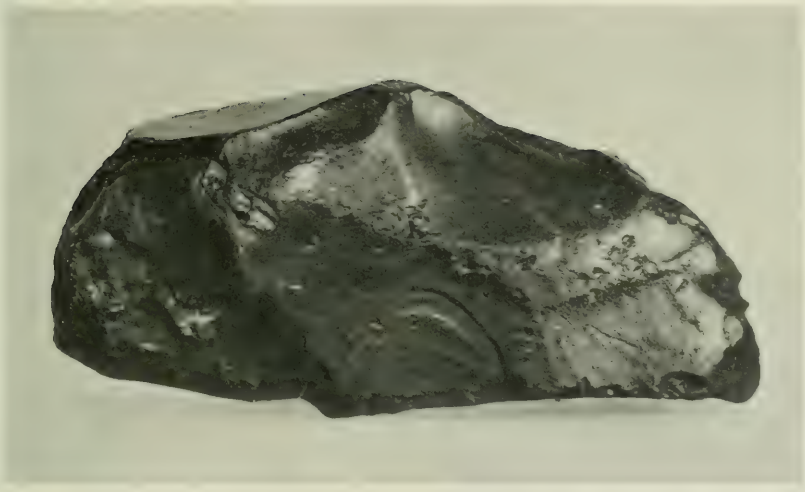

Fig. 8.

Fig. 9.

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